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tain the strength of the stream after the wave had passed, at spring tide I anchored the boat half a mile to the northward of what was then the last cape on the western side of the Gulf, and it proved a more dangerous experiment than I had anticipated; although I anchored in five fathoms, the boat grounded at low-water, and was left high and dry. A few hours afterwards, the noise of the Bore was heard, when every precaution was immediately taken for the safety of the boat. The night was still and calm, and its roar, as it approached, echoing among the neighbouring cliffs, was truly awful. It struck the boat, lifted her, and threw her violently round on her bilge; in which position she was forced before it, broadside on, for the space of five minutes, the grapnel being of no use, for it was carried faster than the boat. I fully expected she would go to pieces, so violently was she shaken. However, no accident happened; for, on getting to a hollow in the sand-bank, which was quickly filled, she righted, much to my satisfaction. About twenty minutes after this I hove the log, and found the stream running seven knots and a half, at which time the boat, I think, could not have been driving less than two knots and a half per hour, which would make the velocity of the stream ten knots. This I did not think too great; for, although calm, the water frequently came over the boat's bows.

Additional Observations on the Remarkable Tides in the Gulf of Cambay. By Captain THOMAS BEST JERVIS, E. I. C. Engineers, F.R.S.

THE situation of this gulf at the extreme north-western limit or angle of the Malabar coast, and consequent accumulation of the head wave at flood tide, propelled, as it is, through a comparatively contracted channel, are the immediate causes of the singular influx of the tide described in Lieutenant Ethersey's paper. The Orinoko, the Indus, and the Ganges, present similar phenomena, though the height or head with which the bore rushes into these rivers is considerably modified by their respective situations, and the directions of their principal channels. The gulf of Cambay is, in point of fact, the great or common outlet of the whole of the waters of Gujarát, which are discharged by seven principal streams; the Sábarmatí, the Máhí, the D'hádar, the Nurbhuddá,* and Taptí, and on the Káthiwár coast, the Bhádar or Góma river, and the Gaïlá, which are better known as the Dhólárá and Bháónuggur rivers, these being the great ports or towns on their banks where the cotton vessels usually take in cargo. The province of Gujarát, as defined in the geographical distribution of the Moghul empire, under the emperor Akbar, comprised the whole of Káthiwár; and the Hindús, at an earlier date, considered it variously, either as constituting part of Saurásh̤trá (Súrat), or (Gurjara) Gujarát. The province, at present, however, is understood to comprehend those districts only, on either side of the gulf, which are dependent on the civil jurisdiction of Ahme'dábád, Khéṛá, Baródá, Broach, and Súrat, the remainder being distinguished as Káthiwár, and under separate authority. In this restricted sense the entire territory of Gujarát is, generally speaking, a completely dead level; insomuch, that the mountain-torrents which accumulate in the provinces of Rájpútánah, Málwah, and Khándésh, immediately on its frontiers, have at different periods cut for themselves channels, of various breadth, depth, and direction, according to the force or quantity of the water which has fallen in particular seasons during the great periodical rains. Sometimes these have taken the direction of the main and ordinary channel, or, on occasions perhaps, of any unusual and continued fall of rain, some new course, according as artificial or local changes may have been favourable to such alteration. Such, in short, is the simple character of this natural drainage of a tract, composed, in most parts of a loose rich alluvial, in all others, of a deep, sandy, or mixed soil—resting on a remarkable calcareous formation, similar in all respects to that in the plains of Bengal and Bahár, and which is termed by the natives *Kankar*. The Bhádar and Gaïlá rise in the Girnár mountains; the Sábarmatí, with its tributary streams, the Mhéswá, Wátrak, Sírí, &c., in the A'rawallí hills; the Máhí river, on the eastern face of the Udeypúr range, which separates Hindústhán from Gujarát; the Dhádar, Nurbhuddá, and Taptí, disemboguing into the gulf north of the Malacca banks, effect the entire drainage of the territories stretching west of the Rájpiplá hills. Of all these channels, the Nurbhuddá and Taptí can alone be considered as rivers, in other words, channels supplied by springs throughout a considerable extent of country, and flowing uninterruptedly during the year with greater or less depth and rapidity. The Sábarmatí and Máhí, which have a considerable breadth and depth from bank to bank, with respect to the country they traverse, may rather be termed great watercourses or drains, as there are so few springs in their whole course, and, indeed, in the entire surface which their tributary channels intersect, that they are almost completely dried up at intervals within three or four months after the periodical rains have ceased.

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* The orthography of the names of places is *not* according to the system usually adopted in this Journal.

The obvious consequence of such drainage is to detach an enormous quantity of alluvium and sand year after year, which, being propelled farther down the channel, would be carried out directly to sea were there no predisposing cause for its deposition. The progressive formation of the Malacca and Bhágwá banks is incidental to the deposition of silt brought down by those streams, and the opposing influx of the tide, conjointly with strong south-westerly gales. By such slow and gradual process the opposite shores of the gulf, as well as the intermediate channels of these deposits have been gradually contracted; to which cause the singular influx of the tide is principally to be attributed. About twenty-five years ago Colonel Monier Williams made a survey of the mouth of the Bhádar river and the neighbouring coast of Cambay (Kambáyet), since which a long spit of mud which projects several miles into the gulf has gradually been formed, and the main channel of the Sábarmatí has also been considerably contracted and altered. There is little reason to doubt that this continual accession of mud will still further contract the channel; though artificial aid and much science would be essentially necessary to the recovery of any such land for the purposes of agriculture. A careful examination of the revenue surveys of the Broach and Súrat Collectorates by Colonel Williams, and the vast accession of the richest lands observable on either bank of the Nurbhuddá, below Unklésur, and on the sea-coast of Súrat within the last two centuries, the period of the latest Moghul assessment, would lead us to conclude that a like process had been going on, time immemorial, in that curious tract called the Run, containing many hundred thousand square miles. Although volcanic agency is supposed to have been the immediate cause of this sinking in of the land, or, with equal probability, the uplifting of the original bed of a great backwater or inlet of the sea, the progressive deposition of silt, brought down by the streams which empty themselves into its bed, must have materially assisted such a change, and favoured further volcanic agency by additional superincumbent matter.

In March and April, 1816, I crossed the gulf from Cambay to Jambúsír, and thence to Gógeh or Gógó, and back to Cambay, and had an opportunity of witnessing the rushing influx of the bore, and observing its direct progress up the channel for several days with great advantage. I had a small schooner belonging to the Collector of Khéra, Colonel Archibald Robertson, of about thirty tons burthen, which was manned by sailors from Gógeh, a class of people who are remarkably courageous and expert at sea. The coolness and dexterity with which they secured and righted the vessel on the rush of the first wave is still fresh in my memory, and I remarked that in casting anchor every day, as the tide went out, when the vessel grounded in the mud, that the Tindál, or master of the vessel, invariably took the precaution of selecting some spot in the direct line of its progress, that is, in the main channel, where, he said, there was less danger to be apprehended than in the neighbourhood of the shores, in consequence of the recoil or curl of the tide along shore, and the falling in of the loose banks. The bore appeared to set in like a straight wall of water with a head of five or six feet, each succeeding wave decreasing more and more, till the whole gulf was reduced to the same level with the sea without. We heard it approach several minutes before it came upon us, when we were fairly lifted up, and afloat in an instant. The shifting of the sand-banks, the gradual filling in of the rivers, and the formation of extensive bars at their entrances, render new surveys of the whole western coast continually necessary for the safety of the navigation to foreign vessels—but the most important service would be rendered to science by an exact registration of the tides, and observations of the gradual accession of land on the one, or detrition of land on the other coast of India; a service which the East India Company alone can originate and execute satisfactorily.

XV.—*Remarks on the supposed Situation of Minoa and Nisæa.*

By Mr. T. Spratt, of H.M.S. Beacon. Communicated by Captain Beaufort, Royal Navy, F.R.S., Corr. Inst. France.

The fortress Minōa of the Megareans, which Thucydides[*] speaks of as an island, and Strabo[†] as a promontory or peninsula, appears to agree with a rocky hill surmounted by a ruined fortress, and standing on the margin of the sea south of Megăra, at the distance of little more than a geographic mile; thus agreeing with the distance given by Thucydides, who calls it about eight stadia.[‡]

That this hill was once a peninsula, appears evident from the dry beds of two rivers which pass close to its base; one on each side. The eastern bed winds round the back of the hill, leaving only a narrow neck of elevated ground between it and that on the west side: and it is therefore clear, that when these two rivers had communication with the sea, the intermediate neck of land, with this hill, would have been a peninsula, or promontory.

These two river-beds were once the only outlets of the moun-

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[*] Thucyd. iii. 51.

[†] Beyond [*i. e.* east of] the rocks called Skirōnides, stretches out the point Minōa forming the post at Nisæa; but Nisæa is the harbour (or dock) of the Megarenses, eighteen [read "eight"] stadia distant from the city [of Megara], connected with it by "legs" [skelé, *i.e.* walls] on both sides. This port is also called Minōa. (Strabo, ix. pp. 391-2.)

[‡] Thucyd. iv. 66.